CLAIMS

1. A method of improvement of toughness of a heat affected zone in a welded joint of a steel plate characterized by subjecting a surface of a heat affected zone formed by a last pass of a multi-layer welded joint of a steel plate to impacts by an ultrasonic vibration tool or shot peening by ultrasonic vibration steel balls to thereby make an average of longitudinal axis of crystal grains up to a depth of 2 mm or more from the surface of the steel plate in the microstructure adjacent to a fusion line (FL) of a weld metal and a steel plate matrix in said heat affected zone formed by the last pass equivalent to the crystal grain size of the steel plate matrix before the welding at a depth of 1/4 of a thickness t from the surface of the steel plate.

2. A method of improvement of toughness of a heat affected zone in a welded joint of a steel plate characterized by subjecting a vicinity of a toe portion of a fillet welded joint of a steel plate to impacts by an ultrasonic vibration tool or shot peening by ultrasonic vibration steel balls to thereby make an average of longitudinal axis of crystal grains up to a depth of 2 mm or more from the surface of the steel plate in the microstructure adjacent to a fusion line of a weld metal and a steel plate matrix in the heat affected zone in the vicinity of the toe portion equivalent to the crystal grain size of the steel plate matrix before the welding at a depth of 1/4 of a thickness t from the surface of the steel plate.

3. A method of improvement of toughness of a heat affected zone in a welded joint of a steel plate as set forth in claim 1 or 2, characterized in that the average of longitudinal axis of crystal grains up to the depth of 2 mm or more from the surface of the steel plate is 30 μm or less.

4. A method of improvement of toughness of a heat affected zone in a welded joint of a steel plate,

characterized by subjecting a vicinity of a toe portion of a one-pass or several-pass large heat input welded joint of the steel plate to impacts by an ultrasonic vibration tool or shot peening by ultrasonic vibration steel balls to thereby make a length of an undercut formed in said toe portion 0.3 mm or less.

5. A method of improvement of toughness of a heat affected zone in a welded joint of a steel material as set forth in any one of claims 1 to 4, characterized by supplemental heating said steel plate before or during the impacts by the ultrasonic vibration tool or the shot peening by the ultrasonic vibration steel balls.